CASE REPORT

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Vital pulp therapy (apexogenesis) of irreversible inflamed pulp (with pulp polyp) in immature permanent molar using calcium hydroxide and iodoform paste (Metapex): A rare Case report

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ABSTRACT

Introduction: This case report describe the use of calcium hydroxide and iodoform paste in inducing the apex development in Vital Pulp Therapy (apexogenesis) in permanent lower molar having pulp polyp. *Methods*: Pulpotomy of coronal pulp of immature permanent molar was done and the remaining pulp was capped with calcium hydroxide and iodoform paste (metapex) after achieving the stop of bleeding. Tooth was restored with conventional GIC. *Results:* Ten months clinical and radiographic follow-up revealed successful preservation of pulpal re-vitality after re-examination of vitality sign of the pulp with continued root development in the treated tooth. *Conclusion:* Depending on the result of this case report, metapex may be an alternative option for pulpotomy treatment of immature irreversible inflamed permanent molars.

Keywords: Apexification, Calcium hydroxide, immature tooth

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1. INTRODUCTION

Deficient development of root canal and lack of apical root end closure makes endodontic treatment complicated. In earlier period teeth with immature apex had been managed by custom fitting of the root canal filling materials with or without periapical surgery along with retrograde filling (Jain et al., 2017). The immature teeth have thin dentinal walls and unfavorable crown-root ratio resulting in short, weak tooth with doubtful prognosis. In this situation the standard therapeutic approach called apexification procedure has been used (Jain et al., 2017). Use of neutralizing substance in infected pulp is a significant step to stimulate the growth of immature roots and for building the calcified apical barrier (Mathew et al., 2017; Ajwani & Saini, 2011; Pradhan et al., 2006).

Taking into consideration of osteo-induction properties of calcium hydroxide, apexification was introduced in a non-vital permanent incisor. Histologically Cementoid or ostoid, the calcified material that forms over the apical foramen has been identified (Jain et al., 2017; Silveira et al., 2015). Apexification procedure with calcium hydroxide despite its popularity has few disadvantages. Therefore a search continues for other materials that promote natural end closure; like metapex (calcium hydroxide with iodoform formulations) (Jain et al., 2017; Harandi et al., 2013; Bodrumlu et al., 2013).

This article reports a case where root end growth and apical closure in the permanent molar of a child was done successfully with metapex (calcium hydroxide and idoform paste).

2. CASE REPORT

A 12 years old girl presented to the pediatric clinic with severe pain that make her not to sleeping at night. The patient does not suffer of any medical problems. Clinical examination showed a decayed permeant lower right first molar #46 and the adjacent primary second molar #85. The involved teeth was responded to vitality test with severe pain that extend up to 2 minutes in tooth #85 and moderate pain with almost 1 minute duration in #46. The tooth #46 showed pulp polyp through the middle of tooth crown (figure 1a). The tooth #85 was having grade 2 mobility and badly decayed. The apical examination was showing no symptoms to percussion and palpation for both. The Radiographic examination showed immature apices with no apical lesion for #46 and the #85 was normal apically (Figure 2a).

Depends on clinical/radiographic examination that showed coronal destruction of both of teeth (#46 and #85); we decided to start pulpotomy for #46 and extract the mobile primary in next visit. Coronal pulpotomy was done for the permanent molar in the first visit under local anesthesia with 2% lidocaine and 1:80,000 epinephrines under rubber dam and gingival protector isolation for maximum benefit isolation. The caries and polyp excavated using high speed handpiece with sterilized diamond round bur under saline cooling (figure 1b). Sterile cotton pellets and 5.25% NaOCl were used to control the bleeding. The coronal part was filled with 3mm Metapex touching the canal orifices and conventional GIC restoration was sealed the tooth coronally (figure 1c, d) and (figure 2b) and the patient was given appointment after 1week.

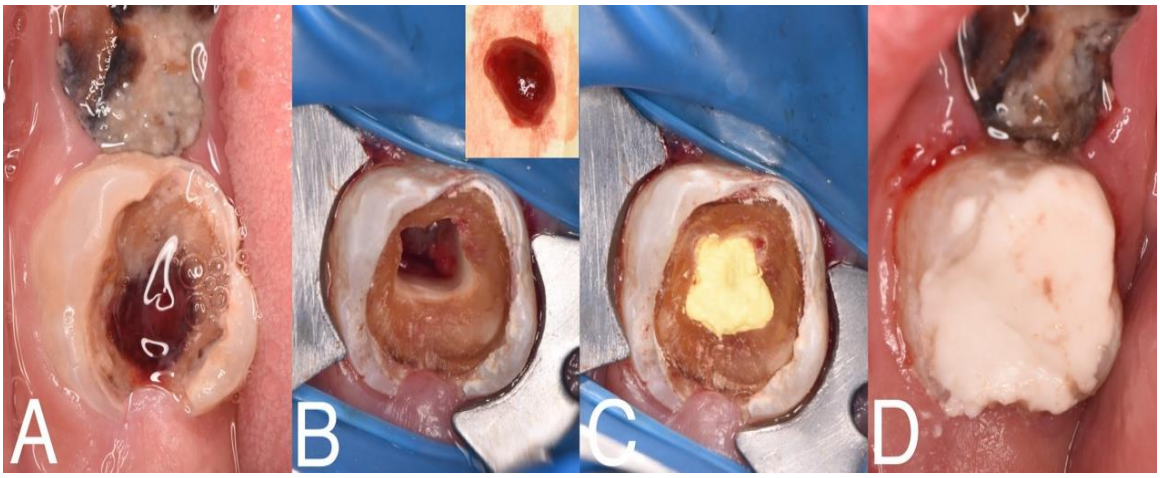

Figure 1 Clinical picture preoperative with pulp polyp and post- operative after removal of caries and coronal pulpotomy done with metapex in chamber. 1st appointment: A) Pre-operative photograph showing pulp polyp B) After caries removal and coronal pulpotomy C) Application of metapex in chamber D) GIC restoration

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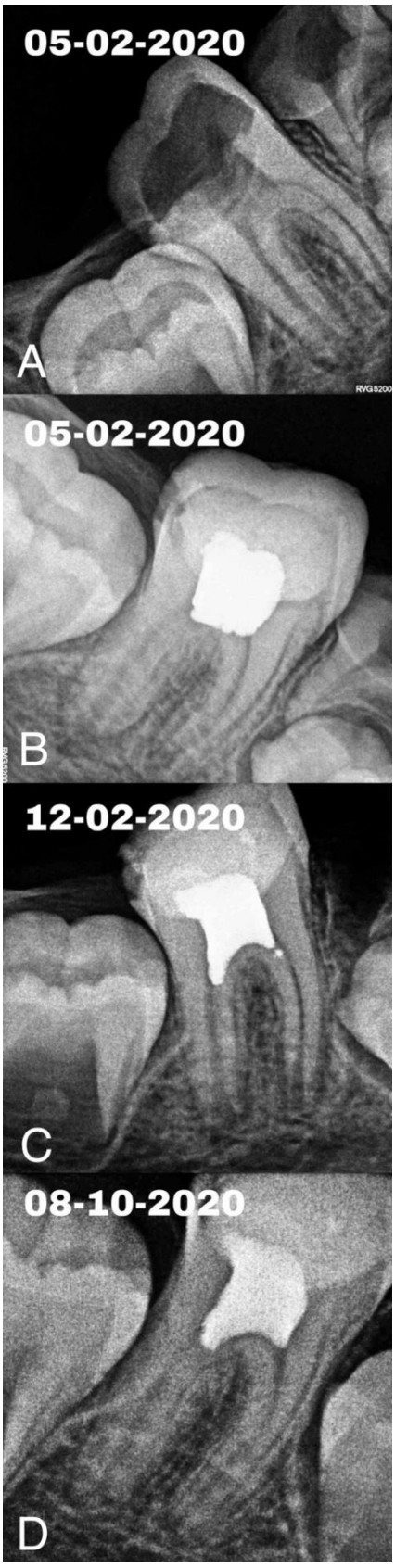

Figure 2 Preoperative and postoperative x-ray taken during 1st, 2nd and 3rd appointment

A) Pre-operative periapical x ray showing open apex (1st appointment) B) Post-operative x ray showing radioopaque material in chamber with acceptable coronal seal (1st appointment) C) After replacement of metapex and GIC (2nd appointment) D) 8 months follow up (3rd appointment)

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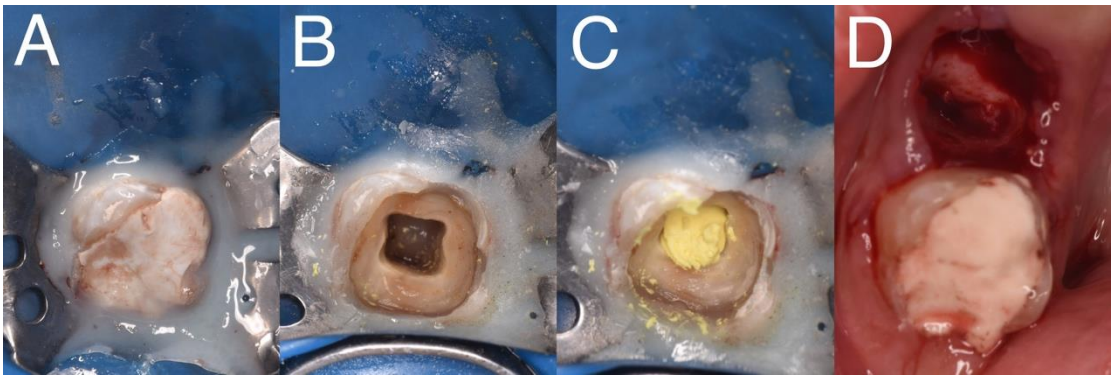

Figure 3 Clinical pictures during 2nd appointment

A) Pre-operative photograph showing GIC restoration B) After complete caries removal and removal of old metapex filling C) Application of new metapex in chamber D) New GIC restoration

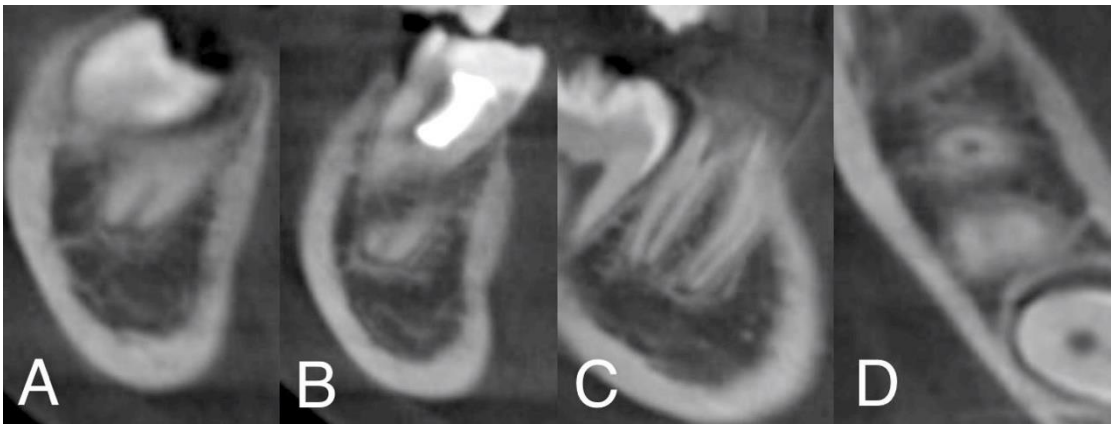

Figure 4 During 3rd appointment. CBCT radiography showing the almost closed apex in different planes

(a) Sagittal plane showing almost close distal root

(b) Sagittal plane showing the closed mesial root

(C) Coronal plane showing both the roots mesial and distal with almost closed apex comparing with pre-operative x ray

(d) Axial plane showing the apex almost closed.

Patient presented to the clinic after 1 week complaining of same chief complain of severe pain. The treatment planning was to determine if the source of pain related to the #46 or to the #85. After examination of the tooth #46 with thermal cold test, there was normally responsing with slight lingering pain much less in severity comparing to the last visit. The cold test with #85 was having severe continuing lingering pain. Then the tooth #85 was extracted after new metapex application to #46 with removal of the remaining caries and making better coronal seal with GIC coronal restoration (figure 3a, b, c and d). Patient prescribed pain killer and after phone follow up in CORONA DAYS, the pain was gradually decreased and stopped within 10 days. The 3rd appointment was 8 months after pulpotomy and the tooth 46 was examined with cold test and showed normal response with no symptoms in percussion or palpation. The peri-apical x-ray showed continuing roots formation and the apex was almost closed. The CBCT also showed no apical changes (figure 4).

3. DISCUSSION

Inducing the apical barrier or apical stop is important to obtain the success of the treatment in apexification cases and aim of treatment comes firstly as to prevent the bacterial effect in root canal system by neutralizing it to alkaline filed to induce the continuing formation of the root that make it stronger and more stable (Silveira et al., 2015; Boufdil et al., 2020; Gawthaman et al., 2013; Grag et al., 2014). According to American Association of Endodontics "Apexification" can be defined as a "method to induce a calcific barrier in a root with an open apex or the continued apical development of teeth with incomplete roots and a necrotic pulp" (Jain et al., 2017; Jaikaria et al., 2019).

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Various materials have been used for the apexification of nonvital permanent teeth such as Zinc oxide-iodoform, resorbable tri-calcium phosphate, calcium hydroxide based materials, Walkhoff's antiseptic paste, polyantibiotic paste, Vitapex, calcium hydroxide powder mixed with different vehicles, collagen-calcium phosphate gel, osteogenic protein, bone growth factor, oxidized cellulose, tricalcium phosphate and MTA (Jain et al., 2017; Sridhar & Tandon, 2010; Ajwani & Saini, 2011). The apical barrier formed as a cap, bridge or an ingrown wedge can be made up of cementum, dentine, bone or osteodentine (Silveira et al., 2015). Osteodentine is supposed to be formed from connective tissue at root apices when Hertwig's epithelial root sheath (HERS) are not present. Steiner & Hassel (1971) reported that histological study of the apical calcific barrier proved it to be cementum (Pradhan et al., 2006). Cwikla et al. (2005) determined the antibacterial efficacy of the three Ca(OH)2 formulations and established Ca(OH)2 when mixed with idoform and silicon oil (Metapex) to be most effective as dentinal tubule disinfectant (Boufdil et al., 2020; Mahajan & Chawla., 2014).

Calcium hydroxide placed inside the root canals dissociates into calcium and hydroxyl ions. Structural damage of bacterial proteins and nucleic acids results when the hydroxyl ions which are formed destroy the lipids. The high alkaline pH of Calcium hydroxide activates alkaline phosphatase enzyme which releases inorganic phosphate ions. The inorganic phosphate ions produced reacts with calcium ions in blood stream forming calcium phosphate. Calcium phosphate, the molecular unit of hydroxyapatite, produces mineralization (Pradhan et al., 2006). Frank (1966) classified the outcome of apexification into 4 types (Mathew et al., 2017): Type 1: Normal apexogenesis which is rare, Type 2: Dome shaped apical closure with blunderbuss appearance remaining, Type 3: No apparent radiographic change but positive stop at apex and Type 4: Hard tissue barrier short of apex leaving thin dentinal walls subject to further trauma.

According to Kleier & Barr (1991), within 6-24 months (average 1 year ± 7months) apexification procedure can be accomplished and every 3-6 months refilling of material is recommended. In this present case closure was accomplished at 6 months following the procedure of apexification. Even with the longer time needed for apexification process comparing with MTA, still the calcium hydroxide good alternative material with cost effective that can used for apexification (Bodrumlu et al., 2013).

4. CONCLUSION

In the present case, good clinical and radiographic success in promoting continued root growth and inducing root end closure in immature irreversible inflamed young permanent teeth was done with Metapex.

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Author Contributions

All the authors have contributed equally in preparing the manuscript work & production.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Informed consent

Appropriate signed consent was taken from the patient before writing this case report.

Data and materials availability

All data associated with this study are present in the paper.

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